Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Curtiss-Wright Controls Inc.	)	
	)	ET Docket No. 10-167
Request for Waiver of Part 15 of the	)	
Commission's Rules Applicable to Ultra-Wideband Devices	)	

SUPPLEMENT TO PETITION FOR RECONSIDERATION AND CLARIFICATION

Curtiss-Wright Controls Inc. ("CWCI") hereby supplements the Petition for Reconsideration and Clarification ("Petition")[1] that was filed on February 10, 2012 in response to the Waiver Order[2] in the above-captioned matter. In its Petition, CWCI asked the Commission to modify certain waiver conditions that will constrain the design and will hinder the future deployment of CWCI's Part 15 ultra-wideband ("UWB") ground penetrating radar ("GPR") system, known as 3d-Radar. In this supplemental filing, CWCI further clarifies and more fully explains the scope of its pending request to modify certain of the waiver conditions.

Background

As discussed in the pending Petition, CWCI was very surprised by the strict conditions imposed by the Waiver Order as these conditions effectively "lock" CWCI into a technical design that was already over two years old when the Waiver Order was granted. CWCI, therefore, sought to modify some of the technical parameters in the Waiver Order to

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[1] *In the Matter of Curtiss-Wright Controls Inc., Request for Waiver of Part 15 of the Commission's Rules Applicable to Ultra-Wideband Devices*, Petition for Reconsideration and Clarification, ET Docket No. 10-167, filed February 10, 2012.

[2] *In the Matter of Curtiss-Wright Controls Inc., Request for Waiver of Part 15 of the Commission's Rules Applicable to Ultra-Wideband Devices*, Order, ET Docket No. 10-167 (rel. January 11, 2012) ("Waiver Order").

accommodate new evolutionary designs for the 3d-Radar that will improve GPR performance, lower survey costs and increase public safety. To this end, CWCI submits that the proposed modifications will not alter any of the essential technical parameters imposed by the Commission for the purpose of protecting licensed spectrum users against harmful interference.

Specifically, the Waiver Order imposes four technical parameters that circumscribe the basic design of the 3d-Radar device as follows: (i) the overall spectrum used by the device is between 140 MHz and 3 GHz; (ii) the transmission step size is 2 MHz; (iii) the dwell time per step cannot exceed 2 microseconds during any 3 millisecond period; and (iv) the scan/cycle rate to step through the operating spectrum is approximately 3 milliseconds. Because these technical parameters are so closely inter-related, a change in one parameter -- even a minor change – will necessarily impact the other parameters. Thus, the conditions set forth in the Waiver Order tend, albeit unintentionally, to prevent even minor, evolutionary changes to the technical parameters set forth in the basic 3d-Radar design.[3]

This "freezing of technology" has become problematic for CWCI and its customers who seek to improve device performance over time, through minor software changes in the device. For example, to increase the travel speed for the device (for both economic and safety reasons) as it is

[3] To address this issue, the Petition asks the Commission to modify the first waiver condition in the Waiver Order (which includes these specific technical parameters) so that it would read as follows (with the modified language in bold and underlined): "The device shall operate with stepped frequency modulation in **at least** 2 megahertz steps between 140 MHz and 3 GHz with a scan/cycle rate of **no more than** approximately 3 milliseconds. The system may not **continuously** use any single frequency longer than 2 microseconds in any 3 millisecond period of time." However, by submitting this supplemental filing, CWCI hereby narrows its request so that a modified Waiver Order would only permit 2 MHz, 10 MHz and 20 MHz step devices which have scan/cycle rates of approximately 3 milliseconds.

towed over roadways, either the dwell time per step must be decreased or the transmission step size of the frequency steps must be increased (either of which will increase the overall scan rate for the system and allow higher data collection speeds). However, dwell time can only be decreased so much before the return signal (and associated GPR data) becomes lost in the noise floor. Accordingly, CWCI has been forced to focus on increasing the frequency step size (which was the subject of the pending Petition) to increase survey speed.

For example, it is axiomatic that a 20 MHz step device will cover the same operating spectrum ten times faster than a 2 MHz step device (assuming dwell time per step is the same), which means that the towing vehicle can go ten times faster and still obtain comparable survey results with the large step device. As explained in the Petition, devices traveling at faster speeds and with larger frequency steps are best suited for shallow depth surveying jobs – usually up to five meters in depth -- whereas for deeper probes, a slower travel speed and a device with smaller frequency steps may be more appropriate. In addition, faster survey speeds may be preferable because they decrease the risk of traffic accidents that might otherwise result when a slow-moving survey vehicle is not traveling at the regular speed of traffic flow. For these reasons, CWCI and its customers seek increased flexibility in the step size configurations that can be chosen for the 3d-Radar device.

Clarification of Petition

After conducting additional software testing and analyzing survey results for both the 10 MHz and 20 MHz step designs, CWCI is satisfied that these minor modifications to the Waiver Order will ensure compliance with the most important technical conditions, namely, that a cycle/scan (over the operating range) will take approximately 3 milliseconds and that no frequency step will experience

an accumulated dwell time of more than 2 microseconds. By adhering to these two essential parameters, CWCI will be able to ensure that its devices will always be programmed to operate in a manner that mitigates the risk of interference to licensed spectrum users.[4]

As noted in previous submissions, the step sequencing and dwell time for the 3d Radar device are software-controlled. The device design covered by the Waiver Order was programmed to step sequentially through the designated operating range in 2 MHz steps with a dwell time of 2 microseconds per step and a cycle/scan rate of approximately 3 milliseconds. The new designs, as explained in the Petition, are being programmed to step through the same operating range in 10 MHz or 20 MHz steps (depending on user needs). These new designs, however, will involve multiple passes through the operating range, with each new pass shifted either 1 MHz or 2 MHz (again, depending on user needs), until the device has stepped through every 1 MHz or 2 MHz step of the operating range. The new designs, regardless of step size (10 MHz or 20 MHz) or frequency shift (1 MHz or 2 MHz), will still comply with the maximum dwell time per step and cycle/scan rate set forth in the Waiver Order.[5] Thus, regardless of the step-shift combination, a complete cycle over the operating range will take approximately 3 milliseconds and will produce the same level of emissions as if the device had stepped sequentially in 1 MHz or 2 MHz steps.[6]

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[4] Waiver Order at ¶16.

[5] For example, a 20 MHz step device that shifts 2 MHz after each pass will initially step through 143 central channels (via 20 MHz steps) as follows: 140 MHz, 160 MHz, 180 MHz … 2,980 MHz, and 3,000 MHz. The device will scan/cycle through the operating band ten (10) times, each time shifting the start cycle frequency by 2MHz, so that during the next pass it will step through the operating frequencies as follows: 142 MHz, 162 MHz, 182 MHz … 2962 MHz and 2982 MHz.

[6] Per the plain meaning of the Waiver Order, a "scan/cycle" is the time it takes for a 2 MHz device to step completely through the 140 MHz to 3GHz range. In this regard, the new 10 MHz and 20 MHz step designs with a 2 MHz shift (like the existing 2 MHz step device) will comply with the 3 millisecond condition of the Waiver Order because that is approximately how long it will take for the

Attached in Exhibit A is an illustration of this "step-shift" frequency design for the 3d-Radar. As the attachment shows, a 10 MHz step device that utilizes a 1 MHz frequency shift will require ten passes over the operating range to fully "populate" it in 1 MHz steps; while the same device utilizing a 2 MHz shift will require only five passes to populate the range in 2 MHz steps. Similarly, a 20 MHz step device utilizing 1 MHz or 2 MHz shifts per pass will require, respectively, twenty passes and ten passes to fully populate the operating range with, respectively, 1 MHz and 2 MHz steps. A device that is programmed for a 1 MHz shift will be programmed for a dwell time of 1 microsecond per step and a device with a 2 MHz shift will be programmed with a dwell time of 2 microseconds per step. In each case, the scan/cycle rate for the fully populated operating range will take approximately 3 millisecond, as required by the Waiver Order.[7] Finally, both designs will be programmed to notch out the frequencies required by the Waiver Order.

New Designs vis a vis Waiver Order

As described above, the new designs that step through the operating range every 10 MHz or 20 MHz while shifting 2 MHz with each pass will, over the course of approximately 3 milliseconds, transmit every 2 MHz over the operating range in the same manner as the waivered

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10 MHz and 20 MHz step devices to transmit on every 2 MHz step over the operating range. Thus, the number of passes through the band should not matter as long as none of the 1431 frequency steps (and associated central channels) are visited more than once (with a dwell time not exceeding 2 microseconds) in any 3 millisecond period (or comparable time period it takes to complete a single cycle). Indeed, the only difference between the waivered 2 MHz step design and the new 10 MHz and 20 MHz step designs featuring a 2 MHz shift is the sequence in which the frequencies in the range are covered (which is not a condition of the waiver). For purposes of spectrum utilization (and hence threatened interference), the end result is the same.

[7] Attached in Exhibit B is a chart that provides some of the technical parameters of the new 10 MHz and 20 MHz step device designs and of the 2 MHz step device that is covered by the Waiver Order.

2 MHz step device. The only difference between the waivered device and the new design is that the latter will be "shift-sequenced" instead of direct sequenced. However, in terms of the interference potential to a victim receiver over the same 3 millisecond interval, the effect will be the same. Therefore, the 10 MHz and 20 MHz step designs that employ a 2 MHz frequency shift, arguably, fall within the current Waiver Order.

CWCI recognizes that the 10 MHz and 20 MHz step devices which shift 1 MHz after each pass through the operating range do not literally fall within the conditions of the Waiver Order. For devices programmed to operate in this manner, the dwell time on a given central channel will be set to 1 microsecond so that, by the end of an approximately 3 millisecond cycle (which consists of multiple scans through the operating range), the device will have transmitted over the entire operating range in 1 MHz steps. While this effective 1 MHz step size is half that of the device permitted under the Waiver Order, the dwell time per frequency step is also halved, so the interference potential from these designs is no greater than the waivered device. Moreover, these devices will continue to be subject to the same emission limits, marketing and eligibility requirements as other UWB GPR devices and, therefore, the risk of interference from these new devices will be no greater than the risk of interference from other UWB GPR devices.

Conclusion

In light of the above, CWCI respectfully requests that the Commission accept this supplement to the pending Petition and reconsider the Waiver Order as requested herein. Specifically, the Commission should modify the first condition of the Waiver Order so that it expressly permits 3d-Radar devices to operate with stepped frequency modulation in 2 MHz, 10 MHz and/or 20 MHz steps (including those that involve a frequency shift of 1 MHz or 2 MHz as described herein).

Respectfully submitted,

By: */s/ Terry G. Mahn*

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Exhibit A

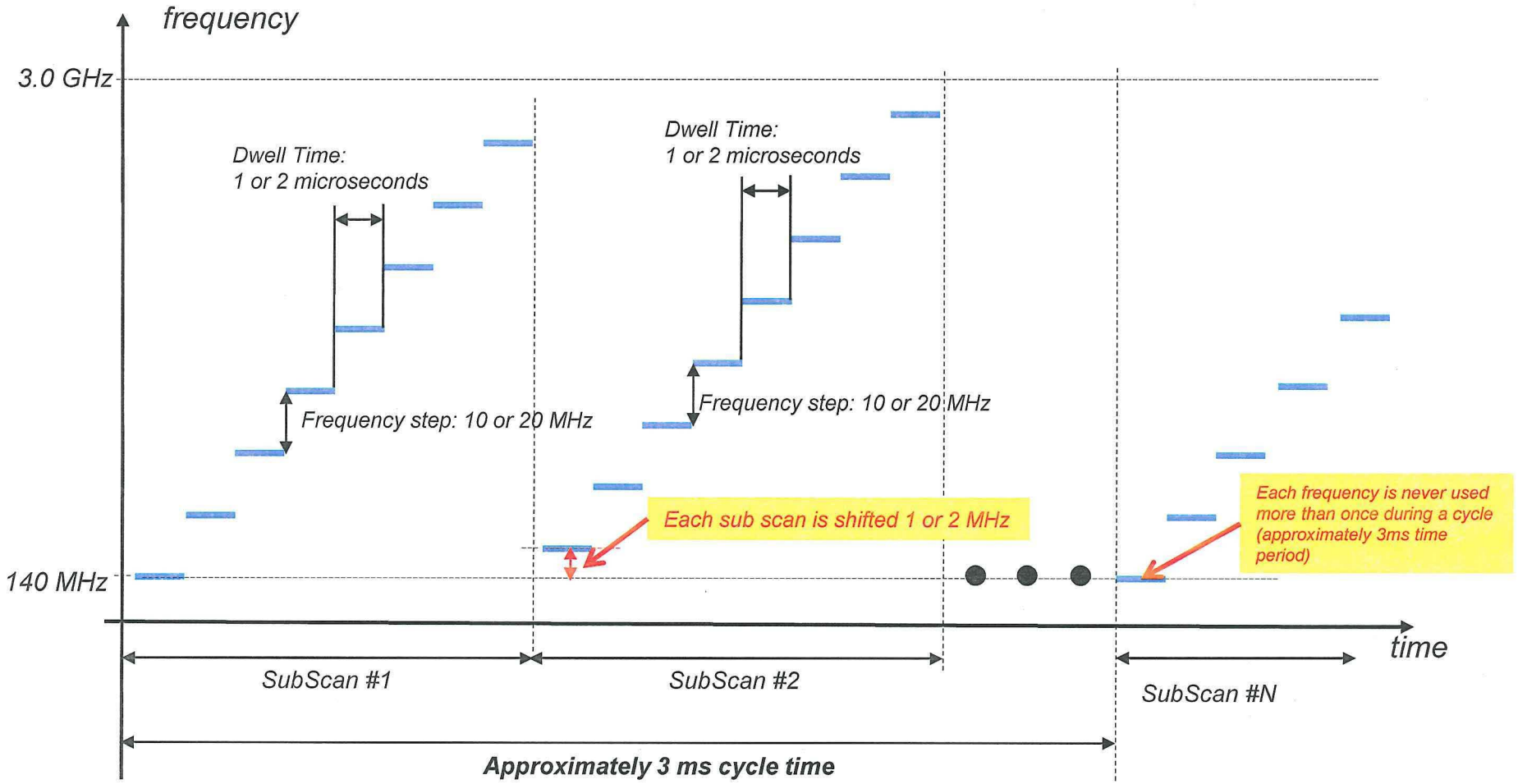
frequency
3.0 GHz
140 MHz
Dwell Time:
1 or 2 microseconds
Dwell Time:
1 or 2 microseconds
Frequency step: 10 or 20 MHz
Frequency step: 10 or 20 MHz
Each sub scan is shifted 1 or 2 MHz
Each frequency is never used more than once during a cycle (approximately 3ms time period)
time
SubScan #1
SubScan #2
SubScan #N
Approximately 3 ms cycle time

EXHIBIT B
COMPARISON OF 3D-RADAR GPR DEVICES

Frequency Step Size	Frequency Shift	Dwell Time	Total Number of Steps Per Cycle[1]	Cycle Time (Approximately)[2]
2 MHz	1 MHz	1 μs	2,860	2.86 ms
2 MHz	none	2 μs	1,430	2.86 ms
10 MHz	1 MHz	1 μs	2,860	2.86 ms
10 MHz	2 MHz	2 μs	1,430	2.86 ms
20 MHz	1 MHz	1 μs	2,860	2.86 ms
20 MHz	2 MHz	2 μs	1,430	2.86 ms

[1] Subject to notching. "Total Number of Steps Per Cycle" equals the number of unique central channels that are stepped though during a single cycle.

[2] "Cycle Time" equals "Dwell Time" multiplied by "Total Number of Steps Per Cycle." Due to internal system overhead, the actual cycle time will be approximately 3 milliseconds.

CERTIFICATE OF SERVICE

I, Alicia Gartrell, a secretary to the law firm Fish & Richardson P.C., hereby certify that a true and correct copy of the foregoing Supplement to Petition for Reconsideration and Clarification was sent by first-class mail on January 8, 2013 to the following parties:

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